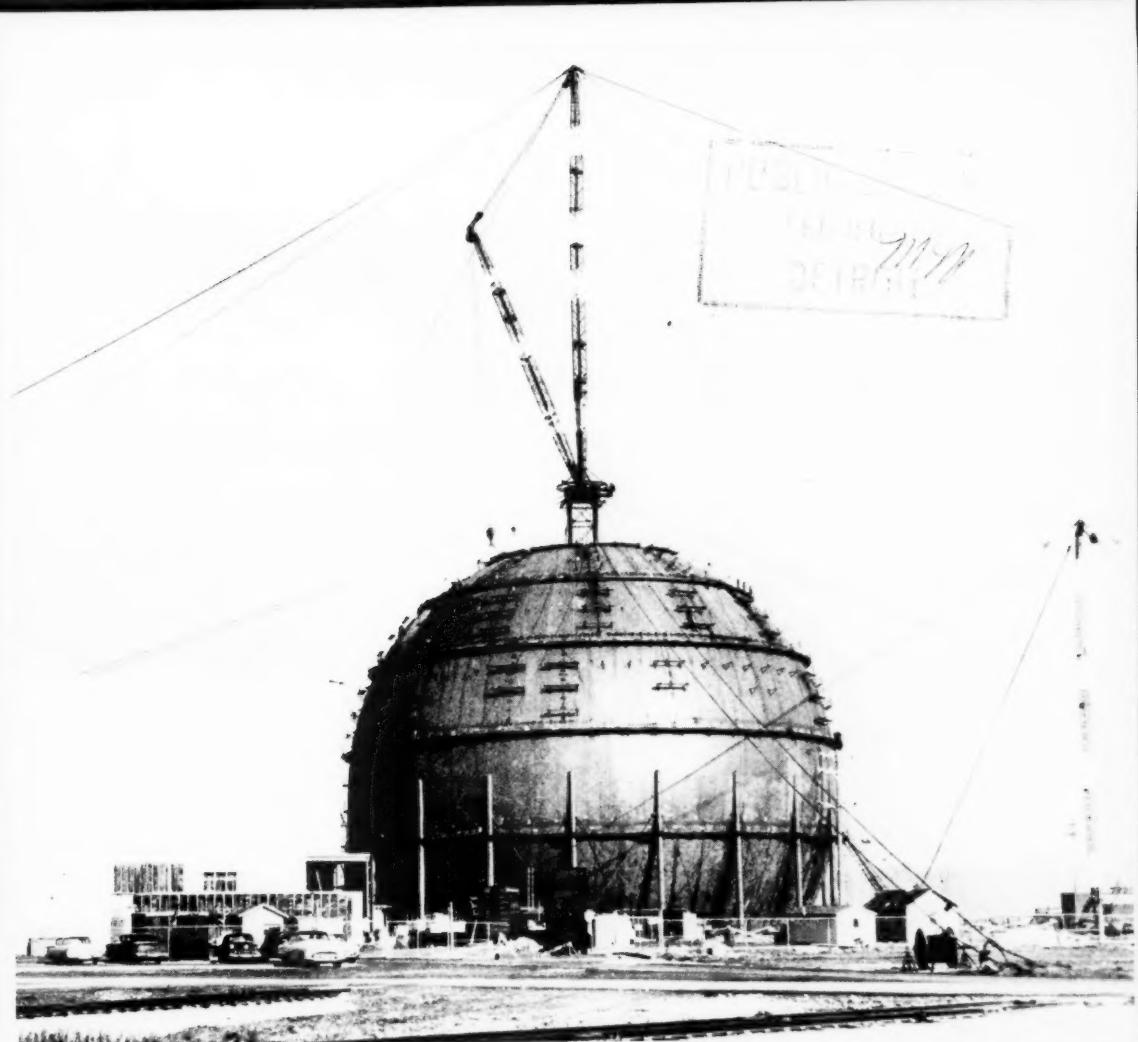


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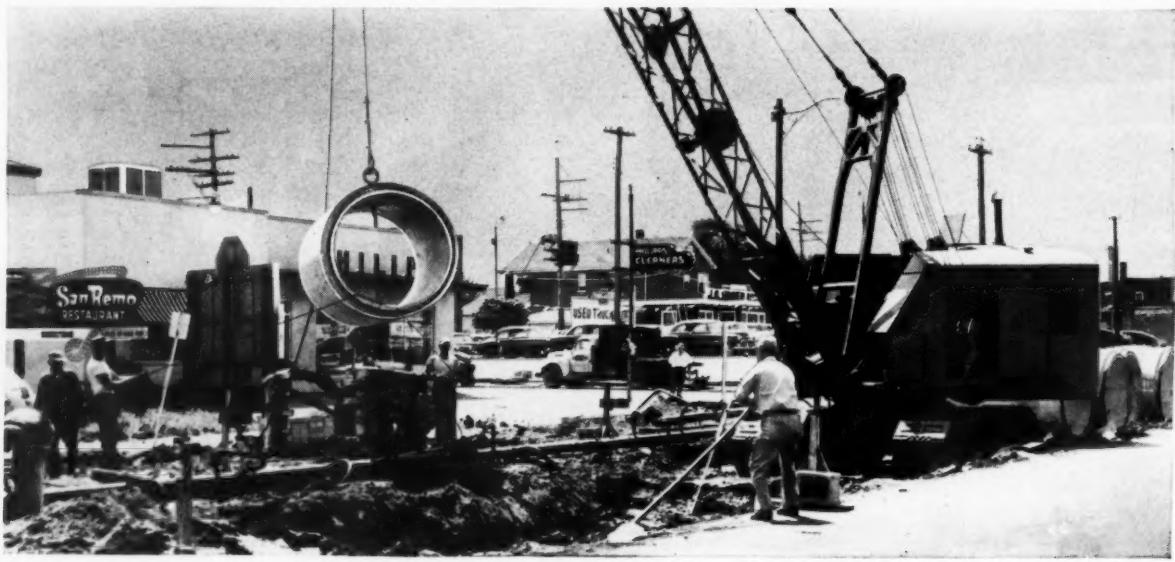


Vol. 10

THE BEST IS NONE TOO GOOD—PAGE THREE

JANUARY, 1958

No. 8



Above: South Broadway Interceptor
Below: Tolleston Area: Chase Interceptor; 25th
Street Interceptor
Engineer: Hurst-Roche, Inc., Hillsboro, Ill.
Contr.: Witter-Gaddis Constr. Co., Schererville, Ind.
Rhode Island Interceptor (not shown)
Engineer: Hurst-Roche, Inc.
Contractor: Marsch Construction Co., Chicago



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The second project, the Tolleston Area: Chase Interceptor; 25th Street Interceptor, was a \$4 million job. The Chase Interceptor required about 2 miles of reinforced concrete sewer pipe from 60" to 132" in diameter. The 25th Street Interceptor required one and one-half miles of concrete pipe ranging from 24" to 84" in size.

The 132" pipe was the largest ever installed in northwest Indiana. Both projects were financed by bond issues.

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January, 1958

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COVER STORY

The huge steel sphere and the turbine building for Commonwealth Edison Company's Dresden Nuclear Power Station are nearing completion (see the cover for October, 1957). Located on the Illinois waterway, 50 miles southwest of Chicago, the 180,000-kilowatt station will have the largest nuclear power reactor under construction in the country. It is scheduled for operation in 1960.

The next step will be to remove the construction derrick from the center of the 190-foot sphere. Then the top and bottom will be capped and the airtight sphere tested to insure it will withstand the specified pressure of 29½ pounds per square inch. Later an opening will be cut in the sphere to permit entry and installation of the boiling water reactor assembly.

Dresden is being built by General Electric Company for a contract price of \$45,000,000.



A NIGHT IN PARIS

FRIDAY, FEBRUARY 21, 1958

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5:00 P.M. Paris Flea Market—In the several large rooms on the 6th floor, a replica of the world famous Paris Flea Market will be in operation. Here at the many booths, you can buy a wonderful array of novelties all donated by members of W.S.E. A committee of 15 wives of members has been organized and will operate this market for your enjoyment. You can pick up some interesting items at bargain prices. Pictures . . . art novelties . . . wines . . . cosmetics . . . sports paraphernalia . . . clothing accessories . . . jewelry, etc.

Articles will be sold at a silent auction—so come early and write in your bids.

6:00 P.M.—Hors' d' oeuvres and refreshments in the 6th floor lounge and in the Parisian sidewalk cafe adjoining the Flea Market.

7:00 P.M. Montmartre Dinner on the 5th floor with a real Parisian Floor Show.

8:30 P.M.—Flea Market will re-open with final bids and payment for all purchases. (All proceeds of Flea Market will go to W.S.E.)

9:15 P.M. "From Monaco to Manhattan"—Another fascinating color movie and narration by Bob Bacon.

He will refresh your memory of the Grace Kelly wedding, take you to some unusual spots in Paris, pick up the human side of the British, and finish out with some thrilling shots of the S.S. Queen Elizabeth in a storm at sea and the tranquility of our Statue of Liberty and Manhattan.

R. H. Bacon is a member of the Western Society of Engineers and is head of R. H. Bacon & Company operating the world's largest magazine clipping bureau. As he gets around the world, he takes both movies and slides and has done a lot of lecturing around the country on, what he terms, an amateur basis—although a lot of the professionals come out to hear him. Bob and Ruth Bacon will leave in April for Japan, the Scandinavian countries, Russia, and the Brussels World Fair to compile another collection of memorable documentaries.

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The Best is None too Good

By Dr. Lee A. DuBridge

I am very glad that the sponsoring organizations which arranged this conference chose as its theme, "Engineering and Scientific Education—Foundation of National Strength." This, it seems to me, puts the problem in exactly the right perspective. It avoids the endless discussion of just how large the engineering shortage is; of just why, if there is a shortage, some engineers still can't find jobs or get higher pay. It avoids the controversial arguments about how much wastage of engineering and scientific talent there may be—the sweeping charges and denials of which seem to get us nowhere. It even relieves us of any temptation to bemoan the fact that the Russians are producing more engineers than we are. It is *our* foundations of strength we are concerned with—not theirs.

In this Conference we have implicitly recognized a few basic and undeniable facts: (1) as a society becomes more technologically complex it requires that an even larger fraction of its working force shall have technical training; (2) these technically trained people—the scientists and engineers—are indispensable to any modern society; they are indeed the "foundation of its strength"; and (3) unless such men and women are found and educated we will not have them—and an important element of our foundation will be missing.

And so today our attention has been focused in a most illuminating way just at the heart of the problem—how do we best find and educate the growing number of scientists and engineers that our society will need in order to build sound foundations of strength for the future? For it is now evident that we can no longer "trust to luck" that an adequate number of adequately qualified technical men will somehow appear. We must

evolve a national program to insure the supply.

But, even though we have brought our attention down sharply to a single issue, it is still a terribly big and complex problem. Men and women have been talking, in one way or another, about education for thousands of years. It would be unfair to say that all the talk has been for nothing, because there has been enormous progress. But the talk has not solved all the problems. Nor is it likely to. For this field of education—like the field of science itself—is one in which two new problems arise every time one has been solved. We can, in other words, assure those who make it a business to talk about the problems of education that they have a permanent job. That there will be plenty for them to talk about as long as they and their grandchildren shall live. And there will be plenty for them to *do*, too.

Education indeed is just one piece of life itself; it presents an ever changing kaleidoscope of fascinating problems—and seeing these problems merging from one into another, with always a new pattern emerging at every turn, is one thing that makes life worth living.

But the fact that there will be future problems possibly even more fascinating than the ones we face today does not excuse us from the necessity of facing frankly those now before us, and doing what we can to solve them—just in order that the patterns of tomorrow *will* be different and not just the same ones left over from today.

Now I suppose the problems of higher education generally—and the education of scientists and engineers in particular—can be summed up in four questions:

1. How many shall we educate?
2. How well shall we educate them?
3. How much will it cost?
4. Where do we get the money?

Some of my college president friends would be delighted if they could answer

the last question; the rest could take care of themselves.

Unfortunately, these questions are not unrelated. The number we can educate is not independent of the quality of education we give, and both will be critically affected by the funds made available. Also, to a large extent, funds will come only in response to proved needs and proved achievement. Hence we must, in seeking new funds, be prepared to answer clearly the first two questions, which I shall refer to as the questions of quantity and of quality.

As to Quantity

Americans love figures; we love to reduce our problems to numbers—numbers of people and numbers of dollars. So the quantitative side of higher education has received great attention.

It deserves to! The quantitative problem is terribly important. There is just no question about the fact that the American people are determined to see to it that not less than 30 percent of their children enter college, and the chances are better than even that in 10 years, more or less, the goal will be approaching 50 percent. In some of the more prosperous states 50 percent of the high school graduates *now* enter college. The figures hit 59 percent in California this year—thanks in large measure to the junior college system.

Now, since all the children who will reach the age of 17 during the next 17 years have already been born, we can easily count them and thus find out how many potential college entrants there will be. This has been done—and the figures are pretty staggering. The number of 17-year-olds who could potentially be applicants for admission to our institutions of higher education was 2,300,000 in 1956, and will be 3,900,000 in 1972, an increase of 70 percent. If the fraction of these who enroll in college continues to increase as in the past, we would have more than doubled enrollments by that year.

Dr. DuBridge, president of the California Institute of Technology, presented this address before the National Conference on Engineering and Scientific Education on Nov. 1, 1957, in Chicago. The Conference was under the local sponsorship of the Western Society of Engineers.

If our present great educational system of 1800 colleges, junior colleges and universities is just adequate for present enrollments (and I hear little complaint about space going to waste!) then we are going to have to build the equivalent of 1800 more colleges by 1972. Double in 15 or 20 years the plant that has taken 300 years to build! We won't actually double the plant, of course, for many schools can double enrollment with possibly only a 30 to 60 percent increase in plant size. But, in any case, the task is staggering; it will cost for physical facilities alone at least 10 billion dollars, possibly 15 billion, by 1972—say a billion dollars a year.

We now spend 3 billion dollars a year in operating our universities and colleges—about \$1000 per student. It is unlikely that the cost will go down; in fact, to bring faculty salaries to where they should be it must go sharply up. Thus we should add a billion dollars a year immediately to the budget, and by 1972 we may need to be spending \$1400 per student, or 8 billion dollars a year for higher education—in addition to a billion a year needed for plant additions.

All this, as President de Kiewiet of the University of Rochester recently remarked in a brilliant paper on the subject, "All this is absurdly too much." "Or," he adds, "is it?" He goes on to point out that American industry is spending at the rate of 25 billion dollars a year for new plant facilities. Southern California alone is spending a billion dollars a year for new plant. American Telephone and Telegraph spent a billion dollars last year on new telephone equipment. If we can spend that much on helping people talk to each other, might we not spend an equal amount in helping them have something to talk about? Furthermore, 3 billion dollars a year is only 75 cents out of each \$100 of Gross National Product. In 1972, 8 billion dollars will be only \$1.30 out of the projected GNP for that year.

The bill has got to be met. The American people will not tolerate having half their qualified youngsters refused admission to college. The only question is: When shall we pay, and how? Shall we meet the bill soon enough—or too late? Shall we meet it by private gifts or by taxes, or by how much of each?

So much for the quantitative side—a staggering job to be done at a staggering price. But a quite manageable job for the American people.

And let me add one more point. It is not the universities that are begging for all this money for their own aggrandizement. Most of them would prefer to stay at their present size—and just turn away an ever larger fraction of the less-than-brilliant applicants. It is up to the American people to decide whether they want this solution or not. If not, they must pay the bill.

As to Quality

But the quantitative problem is not the most serious one. Americans can scrape up an additional 3 or 4 billion dollars a year by 1972 if they have to. Much more difficult—and more important—than the question of how many students are to be educated is the question of what quality shall the education be.

Unfortunately, in speaking of quality the problems cannot be stated in numbers. We can perfectly easily determine that university A is producing 5000

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graduates a year and university B, 500. But there is no way on earth of measuring *in numbers* which group of graduates has had the better education.

There are, of course, ways of determining that a larger fraction of the graduates of university A appear in *Who's Who* than for university B. Is this because A attracts brighter students in the first place, or because it really gives a better education to comparable students? Or do most of B's students become farmers and not get listed in *Who's Who*?

We can learn too that the faculty members of university A publish more scholarly papers than university B. Are they better papers? And does the faculty also do a better job of education? How shall we tell?

All this does not mean we can dismiss the quality problem. Quite the opposite! It means we must really take off our coats and go to work and examine with great care the things we can expect our universities to do with each different type of student. For the fact is that though quality is difficult to express in numbers it is, nevertheless, a most conspicuous feature of higher education. Any well informed person knows perfectly well which are the finest educational institutions of the country. How do they know?

Now it is fortunate—for me at least—that the subject of this conference is science and engineering. In talking about quantitative and dollar problems it is easy to give over-all facts for higher education as a whole—as I have been doing. But problems of measuring quality are of quite different nature in the fields of science or engineering compared to the fields of the humanities or social sciences, or of law, theology or music, for example. So let us focus our attention on what I will call technical education—which is a rather unsatisfactory but conveniently brief designation for education in the physical sciences and engineering at the college and graduate level.

The quality of technical education can be judged more satisfactorily than can higher education as a whole. Not that quality judgment for higher education is impossible, or for technical education easy. But there are quality criteria in technical education for which we can find moderately good measures.

The conclusive test of what the quality of an educational institution *has been* is, of course, the quality of the alumni. If the alumni of 25 years ago appear to have reached, in relatively substantial numbers, positions of high achievement in science and engineering and if they occupy positions of responsibility in government, in industry and in universities, we can then surely conclude that 25 years ago that institution was doing a fine educational job—or, at least, was attracting exceptionally able students.

If we seek to evaluate the institution of 5 years ago, we are on less sure ground, for the alumnus of 5 years has not yet had time to prove himself—some may indeed still be in graduate school. We can still learn much about the quality of these alumni, however, even though we can be less certain of our conclusions.

In any case, a long history of alumni success is the earmark of the great institution. And since greatness has tremendous inertia—it is difficult to achieve but, once established, has a tremendous tendency to persist—we are usually safe in taking past performance, if consistently maintained, as a good measure of present quality or the lack of it.

I should hasten to point out that making quality-rank lists of institutions by counting up the *total* number of alumni of distinction is still a risky and uncertain business. Some institutions have chosen to excel in certain fields—maybe only one—rather than to spread their resources too thinly over several. But we need not concern ourselves with overall rank lists of institutions. I am interested in institutions whose *goal* is quality and who are

achieving it in at least one chosen field.

Now if the measure of past achievement in a given field is the success of the alumni (their success as scientists or engineers) then we must ask what are the sources of this success? What factors make for continuing high quality? There are, I think, at least four:

1. Quality of students
2. Quality of faculty
3. Quality of leadership
4. Quality of research facilities

Each of these factors is worth a brief discussion.

Students

The matter of student quality is not usually given adequate nor adequately candid attention. The blunt fact is that by any sort of test of intellectual ability ever given, the average quality of students at some institutions is very substantially higher than that found at others. In fact, the upper quartile of students at some colleges may hardly come up to the lower quartile at others.

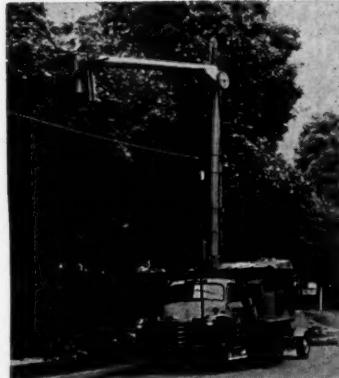
Now I do not say this is bad; in fact, I believe it is good and should be encouraged. I believe top-grade students will get a better education if they are in a place where there is stiff competition. And less able students will also do better if they are not hopelessly outclassed by their colleagues.

It needs to be realized that in technical subjects—in subjects like mathematics and physics which require a high degree of quantitative imagination—the difference in performance between a top student and a mediocre student is really very great. It is far greater than the difference suggested by giving the one a grade of 99 percent and the other 60 percent, for example. It is not a ratio

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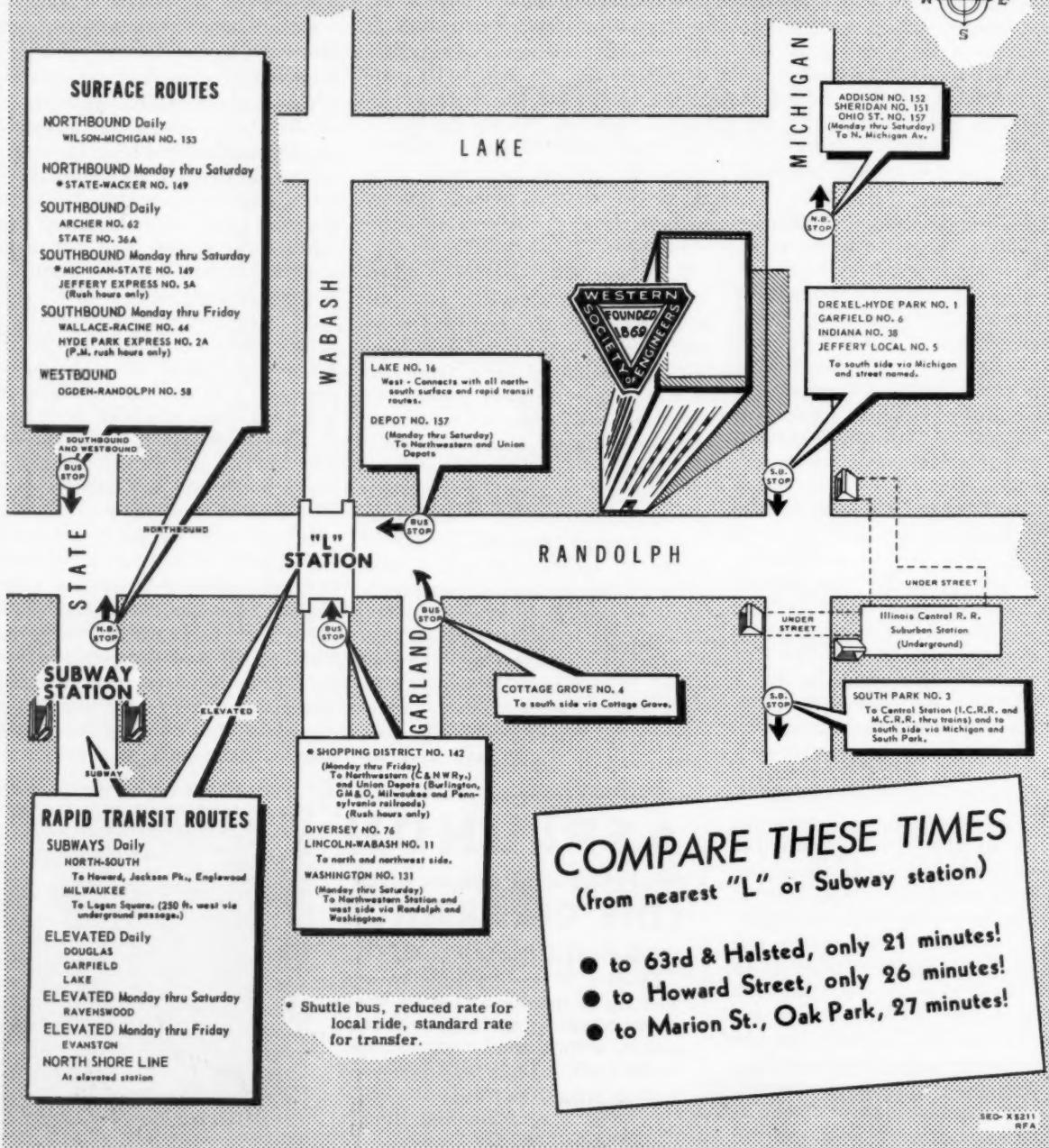
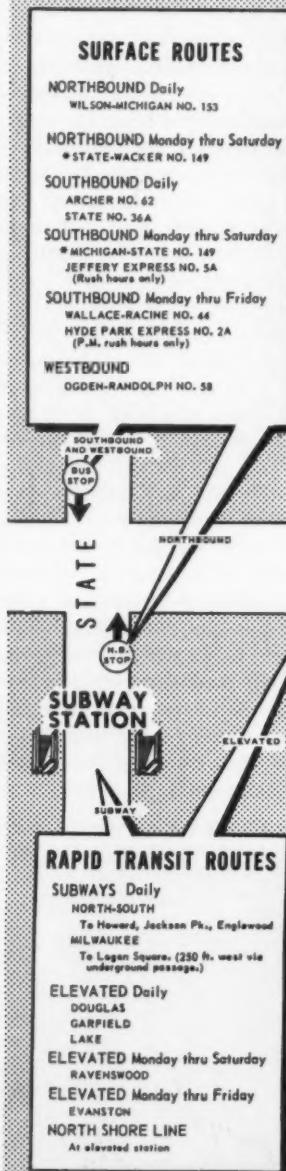
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of 4 to 3, but a ratio of 5 to 1, or 10 to 1—or, occasionally, 100 to 1—that we are dealing with. Now I think you will agree that trying to accommodate in one class a spectrum of student achievement ranging over a ratio of 10 to 1 presents serious difficulties, to say the least. That means a problem assignment which takes 2 hours for the best student takes 20 hours for the least able student. So, if we compromise and let the slowest student off with 5 hours of work, the best student may not even bother to solve such easy problems at all. How we attack this difficult problem is one of the prime questions of technical education.

There are some people who will say we need not worry about the outstanding student—the one in a thousand or one in a million. He will take care of himself. And they will point to the Thomas Edisons and Charles Ketterings who had very little formal education at all.

But I think this attitude is wrong—very wrong. The future creative leaders of our science and technology should have the most challenging opportunities to develop their capacities—intensively and early. You can point to certain great scientists and engineers who were self-taught—but I can point to many, many more who developed under the challenging and understanding encouragement of a great teacher—such as Ernest Rutherford, Niels Bohr, or Robert Millikan, to name but three in my own field of physics. There are so many examples of a great scientist building up a school from which other great scientists have come, that we are forced to the conclusion that even if we admit that a few come through handsomely, even though neglected, we can substantially increase the yield of good technical people if we provide the stimulation, the encouragement and the practical help that a high-quality educational center can give. Maybe the most important function of a great center or a great teacher is just to attract the best students and let them stimulate each other. If so, that is a most significant contribution.

Granted, then, we have a problem both of increasing quantity and improving quality in our educational system. What shall we do?

Shall we, as enrollments tend to rise, simply tighten up the admissions policies of our engineering schools, cutting off,

say, by 1972, the lower half or two-thirds of those who would now be admitted—and try to make up in quality what we lose in quantity?

There are some who advocate this course—and advance in its favor perfectly sound arguments about the importance of quality versus quantity.

Nevertheless, this extreme measure will not be accepted by the American people who are determined to have greater, not less, educational opportunities. Nor is this solution, I believe, either practical or desirable—for four reasons:

1. Our selecting and predicting techniques are not nearly good enough yet to refuse a technical education to half of those who desire it. We should be cutting off many who, because of poor schooling, poor home environment, or other reasons, have made a slow start but may still do reasonably well—possibly very well. At least they should have a chance, somewhere, to try. Individual opportunity must remain. Though we must try to improve our selection techniques, they will never be good enough.

2. We need technical people at a variety of levels and with a variety of skills. And not all the talents we need are necessarily reflected in high academic standing. The old adage that "the 'A' students make the professors and the 'C' students make the money" is no longer good statistics, but it still is more than occasionally true.

3. The quantitative shortage of scientists and engineers is sufficiently severe and sufficiently long-term that we should seek to recruit a larger rather than a smaller percentage of students into our engineering schools. The men of good ability who will thus be salvaged will

pay for the increased "wastage" of those who do not survive. Actually, those who fail or who transfer to other fields are not really "wasted" at all. A good year of physics and math—even if failed—can't possibly do a man any harm!

4. Finally, there is no conclusive evidence that under proper conditions rising enrollments in a particular institution necessarily results in declining quality or in lesser opportunities for the gifted student.

What then do we do to keep broad educational opportunity and also to insure the quality of training we need? I would propose:

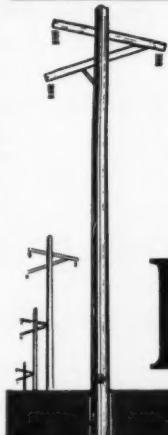
1. Expand facilities for technical training throughout the country, especially in public institutions, to provide space for the same or slightly larger fraction of the total college-age population as now, and at the same time improve our selection techniques to eliminate the loafers and incompetents.

2. Make more extensive use of the junior college as a means for providing the first two years at low cost for many students—thus delegating to those institutions some of the task of eliminating the unfit and preparing the better ones for upper-division work elsewhere.

3. All students of outstanding ability, whenever and wherever they appear, should be given special attention, special encouragement, special incentives to go on beyond the routine work of the classroom, encouraging them, when appropriate, to transfer to other institutions where more adequate facilities or competition will be found.

4. While many technical schools expand their facilities, a few such schools

(Continued on Page 19)



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Nuclear Congress Set for March 17

The atomic energy industry of the United States will demonstrate its progress in the uses of nuclear energy for the benefit of the Western World during the 1958 Nuclear Congress, March 17-21, 1958 at the International Amphitheater, Chicago, Ill.

Further declassification of information will make it possible for the 1958 Nuclear Congress to make available additional material to give further meaning to the conclave's slogan, "Industrializing the Atom."

More than 30 sponsoring organizations will bring together leaders in science, engineering, industry, government, education, health and agriculture in this biggest nuclear assembly, which will include the Fourth Nuclear Engineering and Science Conference; the atomic exposition, "Atomfair"; the 6th Hot Laboratories and Equipment Conference; and the Atomic Energy Management Conference and the American Power Conference.

Coordinating agency for the Nuclear Congress is Engineers Joint Council, while the management is under the direction of the American Institute of Chemical Engineers.

Bruce R. Prentis, of the General Electric Company is general Chairman of the 1958 Nuclear Congress and John W. Landis of Babcock and Wilcox Company and the American Nuclear Society is program chairman of the Nuclear Engineering and Science Conference. Dr. John R. Dunning, dean of Engineering, Columbia University, is chairman of the Nuclear Congress Policy Board. The 1958 Nuclear Congress manager is Joel Henry of the American Institute of Chemical Engineers.

The four major elements of the 1958 Congress and the area each covers are:

1. The Nuclear Engineering and Science Conference on behalf of more than 30 participating engineering and scientific societies, will present 150 technical papers on late developments in the several fields of atomic energy applications, including a number of papers on aircraft propulsion.

2. The Atomic Industrial Forum, Inc., "Atomfair" will be held in conjunction with the technical sessions of the Congress and will feature the latest developments in industrial uses of atomic energy. Registration for the "Atomfair" is

open to Congress delegates and to science-minded people in industry.

3. Atomic Energy Management Conference, sponsored jointly by the National Industrial Conference Board and the Atomic Industrial Forum, Inc., which will provide management with a comprehensive review of progress made to develop low-cost nuclear power and other industrial uses of atomic energy. Representatives from industry, science and management from many countries will discuss the impact of the atom on our economy.

4. The Sixth Hot Laboratories and Equipment Conference, sponsored by the Hot Laboratories Committee of the Oak Ridge National Laboratories, will deal with the highly technical details of the development of equipment and the operation of laboratories for atomic energy.

The American Power Conference is also participating in the Congress. Thus the representatives from many countries to this meeting will be enabled to participate in the aspects of power generation covered by the Congress.

Attendance at the 1958 Congress is expected to exceed that of the 1957 Congress in Philadelphia when 16,000 participated, including 3,000 at the technical meetings.

The "Atomfair" and the conferences are to be held at the International Am-

phitheater, while headquarters hotel will be the Palmer House.

John W. Landis, chairman of the Nuclear Science and Engineering Conference Program Committee, has announced the following general categories which will be covered in the technical meetings: Commercial Use of Radioactive Tracers; Reactor Component Development, Fabrication and Testing; Standardization, Codes and Testing; Reactors for Process Heat and Radiation; Production and Miscellaneous Applications of Radioisotopes; Reactor Operation and Maintenance; Fuel, Control, Moderator and Coolant Materials; Experimental Power Reactors and Advanced Concepts; Health Physics and Instrumentation; Reactor Physics; Temperature Measurement and High Temperature Instrumentation; Waste Treatment and Disposal; Reactor Plant Instrumentation; Reactor Location and Safety; Thermal and Mechanical Design; Reactor Control Instrumentation; Progress in Commercial Power Reactor Development; Reactor Plant Materials; Fuel Element Development, Fabrication and Testing; Reactor Safety and Startup Instrumentation; Reactor Systems Analysis; Research and Test Reactors and Critical Assemblies; Chemical Reprocessing; Water Contamination and Treatment and Reactor Shielding and Containment.

Sponsoring groups for the 1958 Nuclear Congress include: American Chem-

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The Western Society of Engineers, a member of Engineers Joint Council, will be the "host society" for the Congress.

Chairman of the Chicago General

Arrangements Committee is R. D. Maxson, Commonwealth Edison Company. The Chicago Committee has arranged trips to industrial plants in the Chicago area and to the Argonne National Laboratory especially for delegates to the Congress. There will be a student day program, presided over by Joyce Myron, the young lady who won \$64,000 on the television program for her knowledge of atomic energy. The local Committee has also made provision for special activities for ladies attending the Congress.

Greater Efficiency

An important increase in efficiency and a decrease in operating costs in many major industrial processes through the application of modern techniques of electronic computation and control was predicted Jan. 16 in Los Angeles by Dr. Dean E. Wooldridge, president of newly-formed Thompson-Ramo-Wooldridge Products, Inc.

This forecast was made by Dr. Wooldridge in announcing details of the operation of T-R-WP, a wholly-owned subsidiary of The Ramo-Wooldridge Corporation, Los Angeles, and Thompson Products, Inc., Cleveland.

Concentrating its efforts on the field of industrial process control, the new subsidiary is marketing as its first major product the RW-300 digital control computer.

WSE Nominating Committee Appointed

To the Corporate Members:

I am pleased to announce that in accordance with Article X, Section 3, of the Constitution, the Board of Direction has appointed a Nominating Committee as follows:

George L. Jackson (Board Member)
John G. Duba
Ovid W. Eshbach
William V. Kahler
Marvin V. Maxwell
Ralph G. Owens
H. P. Sedwick

The Constitution also provides that suggestions for nominees shall be solicited in the publications of the Society.

J. EARL HARRINGTON
Executive Secretary

Tear off and Return

To the Nominating Committee:

Western Society of Engineers:

I suggest the following names for consideration by your committee for offices indicated.

Officers and Trustees

President
1st Vice Pres.
2nd Vice Pres.
Treasurer
Trustee (eight to be nominated)
1.
2.
3.
4.
5.
6.
7.
8.

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Canada May Import U.S. Coal

Being deficient in fuel, Central Canada probably will import United States coal to provide the cheapest thermal power until nuclear fuel proves a cheaper source, C. E. Baltzer, Dominion Government expert, on Oct. 10 in Quebec, Canada, advised the 20th Annual Solid Fuels Conference, sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers and The American Society of Mechanical Engineers, with the Canadian Institute of Mining and Metallurgy cooperating. It was the first time the Conference had been held outside the United States. The program, a comprehensive review of many phases, was organized by the Coal Divisions of the three groups.

Baltzer, senior engineer, Fuel and Power, Division of Fuels, Department of Mines and Technical Surveys, told the assembled engineers, industrialists and educators that current developments in conventional steam stations "will create coal demand within the next five years several times greater" than the present requirement in Central Canada.

In his paper, "The Canadian Power Situation With Particular Reference to Thermal-Electric Power," Baltzer said.

"From present indications it is evident that most progress in the use of thermally generated power is developing in three main regions — the Maritimes, Southern Ontario, and the Prairie Provinces. In these regions it is expected the power demands within the next 25 years will far surpass the supply of additional, economically available hydraulic energy. Therefore, it can be expected that thermal power will be called on to play an increasingly important role in the Canadian power picture.

"Because of the location of existing fuel supplies, development likely will follow some fairly definable pattern. In Western Canada, where coal, oil and gas reserves are most abundant, these fuels will likely continue to share the market and give the cheapest and most dependable thermal power. However, in Western Canada the trend is toward the low-rank strip-mined coals and lignite of the prairie region which, on a cost basis, have a decided advantage over the high-rank, more costly, deep-mined coals of the foothill and mountain regions of Alberta and British Columbia.

"In fuel deficient Central Canada, imported American coal would seem to be in the best position to provide the cheapest thermal power until nuclear fuel proves a cheaper source of energy. Here, tremendous growth is forecast for Ontario's main utility, e.g., by 1980 the requirement in dependable peak capacity has been estimated at five times today's capacity. Of this, not more than twenty-five per cent is likely to come from hydro-electric sources, whereas, of the remainder, only time will tell what the division will be between coal-fired and nuclear-fueled capacity. Nevertheless, it now is quite obvious that developments under way in conventional steam stations will create coal demand within the next five years several times greater than the one-half million tons a year currently used for this purpose. Coal imported from the Appalachians area of the United States is expected to supply this demand.

"In Eastern Canada, where highest fuel costs presently apply, indigenous coal and imported oil have become increasingly competitive, and either one or the other, depending on circumstances, will produce the cheapest thermal power until nuclear fuel gains the hoped-for advantage at some time yet unknown. Throughout the Maritime

area, oil, so far, has only gained foothold to a limited extent at seaboard points with harbor facilities capable of serving ocean tankers. The bulk of energy for central station use is still provided by coal produced in Nova Scotia and New Brunswick. Inasmuch as the coal reserves of the latter province are relatively small, and the power requirements of the area as a whole are rising steeply, it is obvious that Nova Scotia coal must be depended on for any expanded requirements in the near future."

Baltzer took occasion to remind the group:

"The average Canadian has become very 'hydro-minded' and has certain fixed ideas, if not real prejudice, in favor of the relative importance of hydro- and thermal-electric power. He is firmly convinced that all hydro power is cheap and all thermal power dear. In his opinion, steam-electric power is outmoded, and positively antiquated if it must be produced from coal. This average Canadian does not realize fully that his electrical requirements are rising faster than the ability of hydro to provide power economically. Neither does he realize that the total known hydro potential available for his use is very small—less than one-tenth of one per cent in relation to Canada's potentially available reserves of coal, oil and natural gas.

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"Nor does he appreciate fully the insatiable world demand for the products of the vast forest and mineral wealth of Canada, a demand created by two world wars and the threat of a third, a demand which is only possible to satisfy by gigantic expenditures of energy outpacing any past rate of use."

Pointing to the Dominion's future requirements and capacity as "fantastic" Baltzer said that "to provide fuel for capacity of this order will be a monumental task for the utility industry and its suppliers." He gave it as "the general opinion" that "there would have to be increased dependence on coal, because coal was the largest known resource, and the supply of oil and gas would be required more and more for specialized and preferred high-price applications where the cost of fuel is of less consideration than it is for electrical generation." He added:

"However, ease of transport, convenience in handling, more dependable quality, and lesser capital cost required for plant construction are strong arguments in favor of the fluid fuels in place of coal, and as long as their price is nearly competitive with coal argument can be found to justify their use—even at some advance in the price level. Even so, it is not likely that any utility will establish new plants or even additions to older plants solely for use of either oil or gas without providing flexibility

in the design to permit use of coal at some later date."

Semiconductors for Power Here to Stay

Semiconductors as sources of rectified power are here to stay, two General Electric Company engineers reported Feb. 4 at the Winter General Meeting of the American Institute of Electrical Engineers in New York.

"The interest in semiconductor power supplies, which was touched off by early industrial installations in Jan. 1954, continues unabated," R. M. Crenshaw and A. L. Munn, of San Francisco, told a symposium on metallic rectifiers. "The acceptance of the germanium rectifiers by the electrochemical and metalworking industries is ample proof that the semiconductor is here to stay. Some larger ratings are 40,000 amps. at 24 volts for aluminum anodizing, 15,000 amps. at 65 volts for hydrogen-oxygen gas production; voltage levels are made possible only by the new type of high-current semiconductor.

"Although the silicon rectifier is a relative newcomer, its superior characteristics at high voltages and high temperatures is resulting in its broad application for outputs of 100 volts d-c and up. At lower voltages it is expected that germanium will continue to hold a very important place."

In their paper, "Semiconductor Rectifiers—Present and Future—for Electrochemical Loads," the authors pointed out that despite the increasing popularity of semiconductor rectifiers, there are approximately 8,000,000 kw of mercury arc rectifiers in service in the United States, compared with less than half a million kw of all types of semiconductor rectifiers. The mercury arc rectifier has been the most important source of direct current power in the electrochemical industry, but "semiconductor rectifiers are destined to furnish a much larger proportion of future loads," they said.

Corrosion Resistant Metals to be Featured

Behavior of new corrosion resistant non-ferrous metals in chemical industry applications will be featured during the Chemical Industry Symposium at the 14th Annual Conference and Exhibition of the National Association of Corrosion Engineers. The conference will be held March 17-21, with most meetings and the exhibition held at the Civic Auditorium, San Francisco. The symposium will have 12 papers in three sessions.

Among the materials discussed will be zirconium, titanium, columbium, tungsten and molybdenum. One paper deals with the resistance of materials to concentrated hydrogen peroxide, such as that used in missile rocket engines. Corrosion problems involved in uranium refining, characteristics of lead acid-brick construction and some of the problems encountered in reactors using high purity water and sodium as coolants also will be discussed.

Reactions of structural materials in nitric, hydrofluoric, hydrochloric, sulfuric and other severely corrosive environments are considered in other papers.

Among the more than 80 technical committee meetings to be held during the week are many interesting to engineers in the chemical industry.

Rocket Fuel

A fuel made from fertilizer and old crankcase oil is being used to propel rockets, reports *American Machinist*. The low-cost oil and fertilizer-grade ammonium nitrate can be made into any desired shape, and costs only six cents a pound.

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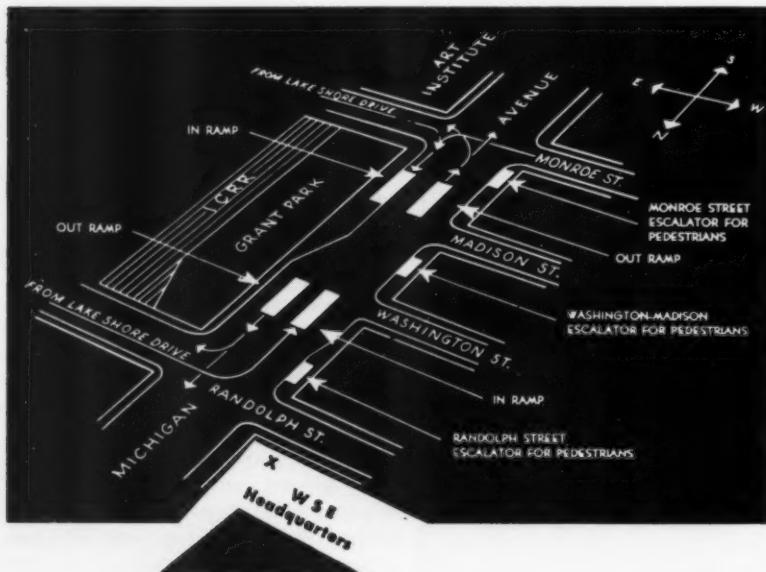
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Do you like to DRIVE?

Then why not drive to WSE meetings and other functions? There's plenty of PARKING almost at the door—the Underground Garage is diagonally across the street from WSE Headquarters (see the map below), two private garages are a block west, and the State-Wacker "Bird Cage" Garage is only a short distance away.

Below: map showing Park Department Underground Garage



Interior view of Underground Garage

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European Research to Help U.S.

A wealth of European technological "know-how" is ripe for application by American industry.

This observation has been made by Irving D. Canton, assistant manager of the International Department of Armour Research Foundation of Illinois Institute of Technology.

Twenty American firms are beginning to reap benefits from European research and development techniques in a unique program conducted by the Foundation.

Under the program, a team of five ARF technologists, headed by Herbert B. Gausebeck, manager of European operations, is headquartered in The Hague, Netherlands, to study European technological developments of potential value in the American markets.

Since the program's inception in July, 1956, a wealth of information on new products, processes, and research trends has been channeled back to the group of 20 non-competing American firms sponsoring the program.

The companies are divided into groups of four in each of five fields: mechanical engineering, electrical engineering, chemistry, chemical engineering, and metallurgy.

An observer of appropriate technical background is assigned prime responsibility for serving the four sponsoring companies in each of the technical fields, Canton explained. If, during the course of his travels, an observer runs across items of interest to sponsors in the other categories, this information is channeled back through the other observers.

As a result of the team's efforts, the ETOG program has:

—Led to the placing of several American firms in contact with their European counterparts to negotiate an exchange of product lines. One American company already is preparing to tool a European product in this country.

—Initiated negotiations between an American producer of mechanical devices and a European electronic devices manufacturer for an exchange of engineering information that will enable both firms to have a complete product line.

—Arranged for an exchange of research information in the chemical category whereby the American company may finance some of the European

firm's research costs in exchange for first rights to utilize any products that may result from the research.

"Some of the participating companies are interested only in advance technological information that may set a trend," said Canton.

For these companies, he pointed out, ARF observers attend scientific meetings and conferences on the Continent and talk to persons conducting basic research in the fields involved.

The observers also establish contacts with European firms that enable American companies to obtain first rights to new products being marketed or developed in Europe.

Another aspect of the service is the feedback of information on products that can be used by the American company to diversify its activities and statistical information for techno-economic studies related to the firm's products.

Under the ETOG plan, observers also review scientific and technical literature for all participating companies to keep them informed of developments long in advance of the appearance of this data in U.S. technical publications.

The large technical staff provides wide geographical coverage, however, costs are kept to a minimum because of the large number of participating companies.

Because of the outstanding success of the program to date, the Foundation is adding other sponsoring companies to the program. A cement firm has been contracted in the new ceramics and building materials category, the first of four companies which will be accepted. An additional four companies are being sought in the mechanical industries.

"Interest in the ETOG program has been very enthusiastic," Canton commented. "However, one of the difficulties of expanding the number of sponsors is in contacting companies that do not conflict in major interests with the firms already in the program. The sponsoring companies prefer the non-competitive aspect of the program, since it allows them to gain exclusive benefit from the program in their field."

A Rush Job — It's for TV

Needed in a hurry to permit installations of TV equipment, the upper floors and roof of the eight story Alberta Government Telephone building, in Calgary, Alberta, were constructed just as soon as the frame of the building was ready, reports *Engineering News-Record*. The project will cost \$11 million, including a substantial sum for the communication equipment, installed before the building below was completed.

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Western Electric Opens 'Center'

Western Electric Company opened its Chicago Engineering Training Center on Jan. 6, 1958. The Center, with facilities occupying 30,000 square feet on the fifth floor of the recently completed Sun-Times Building, can accommodate about 1600 students in a single year.

The students will be Western Electric engineers from company operations in Chicago, Decatur, Montgomery, Columbus, Indianapolis, Omaha, Kansas City, Oklahoma City, Duluth, Buffalo, N. Y., and Lincoln, Nebr. They will attend while detached from their regular working assignments for periods of four or nine weeks.

New engineers receive an opportunity to attend the Chicago Center approximately six months after joining Western Electric. Following the introductory course, the engineer will return to his job assignment for six to eight months to practice his newly learned skills. He will then return to the Chicago Training Center for a second group of courses known as "General Development."

Experienced engineers are also included in the program under the Advanced Development phase. This consists of various courses of two to four weeks duration covering technical subjects of fundamental and theoretical nature.

The new center is especially equipped for educational purposes. Twelve modern classrooms are equipped with sound system wiring and facilities for audio-visual teaching. In addition, there is a fully equipped cafeteria, an electrical laboratory, a library, conference and study rooms, and office space for administrators and instructors. Western Electric staff and instructors will conduct the program along with visiting lecturers from the University of Chicago, Northwestern, DePaul, Illinois Institute of Technology, and various consulting firms. A number of schools cooperated in the establishment of curriculum and faculty.

The 60 young Western Electric engineers, fresh from university campuses, are returning to full-time classroom stud-

ies to sharpen the knowledge they can carry back to their industrial assignments. Dr. John T. Rettaliata, president of Illinois Institute of Technology and treasurer of the Western Society of Engineers termed this "an example of one company's response to the challenge of Russian technology."

Speaking at a luncheon in the Hotel Sheraton during the dedication ceremonies of the center, Rettaliata pointed out that we still need a balanced education.

"Let us not allow the Sputnik scare to cause an over-emphasis of science, or turn in panic to hasty expedients of crash programs which, while promising immediate advantages, weaken our long-range endeavor," he declared.

"Higher education," Rettaliata said, "should strive to develop individuals of the kind described by the mathematician and philosopher, Albert North Whitehead—'men who possess both culture and expert knowledge.'"

"Technological education already is operating on such a basis," Rettaliata said. "Liberal education should follow suit. When it does, the emerging syn-

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thesis will demonstrate that science and liberal education are complementary rather than conflictive.

The growing emphasis on research and the increasing complexity of our technology, will require continuous advances in engineering education to improve the special skills required in industry and stimulate creative abilities.

In the colleges and universities, this will mean greater emphasis on graduate study. The badge of admission into the engineering professions gradually will move from bachelor's degrees to advanced degrees.

Similar objectives are apparent in the Western Electric Company's new Graduate Engineering Training Program. While, quite properly, the program is adapted to the company's needs, there is a broader significance that stamps this undertaking as one of first importance. In supplementing and extending the knowledge of its engineers, Western Electric is making a major contribution not only to the advancement of technological education, but to the national welfare as well. Such programs as this strengthen our hand in a time of need.

The challenge we face is clear. There is an urgent need for special efforts on the part of industry everywhere to answer the challenge of Russian technology. We have before us the example of one company's response to that challenge. The establishment of the new educational center in Chicago, and the similar ones in New York and Winston-Salem, N. C., represents industrial democracy in action.

Technological education, and the nation, are indebted to the Western Electric Company for positive action in one of the ways by which the might of American industry can again be mobilized for the preservation of our freedom and our way of life."

Newest Gimmick

A radar timer hooked into a neon sign by a company in New Hampshire, is the newest gimmick in trying to get motorists to keep on living, reports *Electronics*. The sign lights up to say, "Slow Down You Are Speeding" when a passing motorist exceeds a set limit. Officials report that nine out of ten times the motorist will take his foot off the gas pedal.

Submarine Simulator Helps Train Sailors

With the application of nuclear power, Navy submarines have become even faster and more difficult to handle than before.

To help cope with this problem, and give new sailors the best possible dock-side training, the Electric Boat Division of General Dynamics Corporation built an electronic training device called the Universal Submarine Simulator from engineering specifications provided by the Naval Training Device Center and under contract with them.

The trainer, now installed at the U.S. Submarine Base at Groton, Conn., is run by a roomful of electronic computers which act as its engine room, diving planes, ballast system and ocean.

During the conceptual phases of planning, General Dynamics engineers decided that some means of accurately evaluating the progress of student crews would be needed; something more accurate than visual observation by an instructor.

For example, a method was needed to compare certain elements of a dive, as performed by a student crew, to the same elements as performed by an experienced or "ideal" crew. This had to be a means of instantly and permanently

recording the reactions of the student crew during the dive, a record which could be comparative without interpolation.

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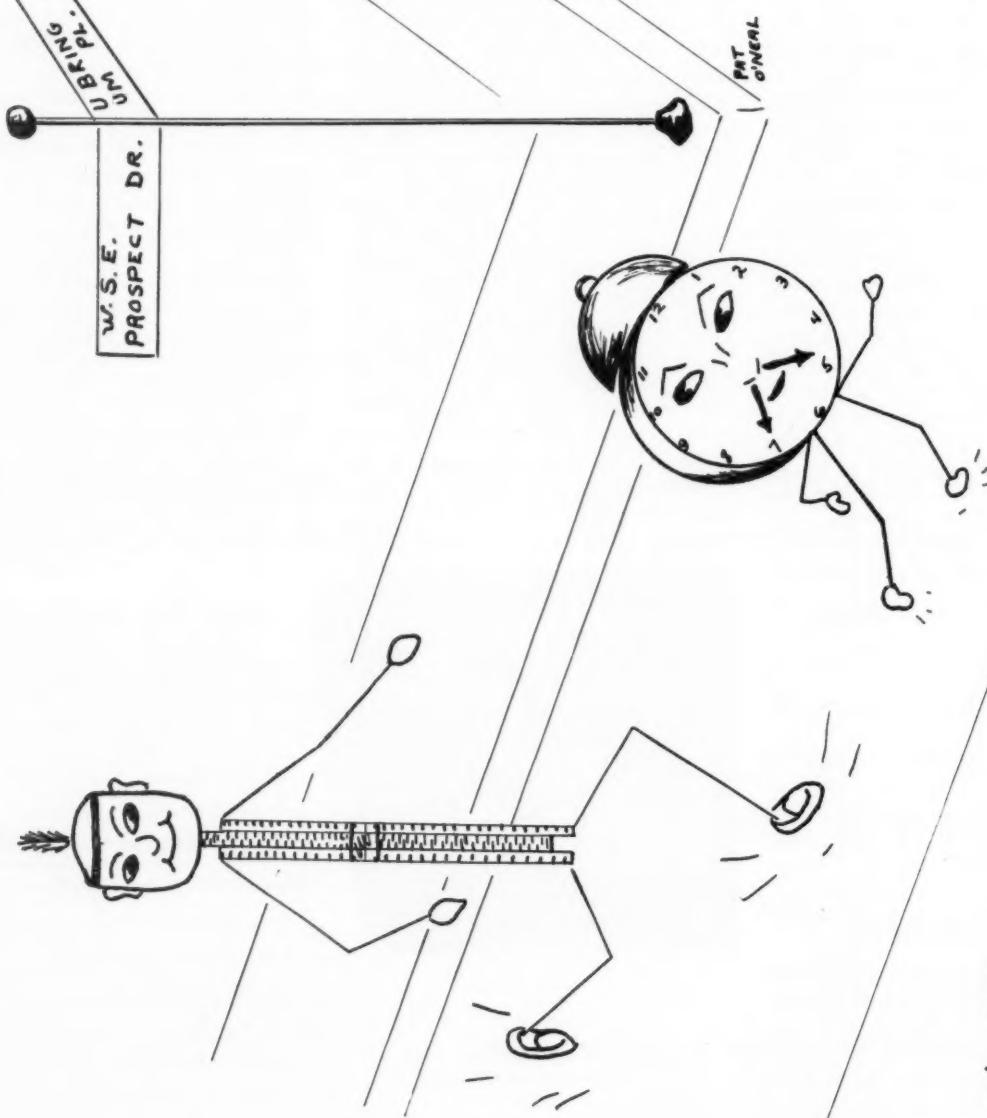
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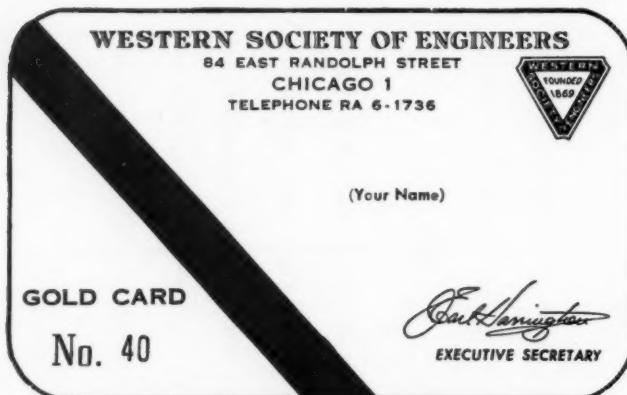
If you haven't returned your proposal cards yet, time *is* beginning to slip away from you. *Today*, while you are thinking about it, fill out the five proposal cards that were sent to you and send them to WSE.

The first five months of 1958 represent almost the entire membership drive for the year. We hope during these five months to gain 1,000 new members. This goal can be reached if each member sends in the names of five prospective members. Experience has shown that about ten percent of these prospective members will join WSE. You can readily see that we will need about 10,000 proposal cards.

So before time slips away from you, send in your 1/2 member today!

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(Continued from Page 7)

around the country should be encouraged in their efforts to select only the most able students and provide them with a supremely challenging program. We have such schools now—and many of them are facing a difficult dilemma. Shall they expand enrollment and make their excellent facilities available to more students—even at some loss in quality—or shall they put all available resources into higher and higher quality opportunities for a carefully selected few? Or can some, in fact, expand and raise quality also? I would not presume to judge what the proper course is for any particular school—except my own. But I do suggest that those who do elect to give high-quality instruction to a select few be given encouragement and support—in spite of the fact that some segments of public opinion will brand such institutions as "undemocratic," a horrible distortion of the meaning of that word.

Faculty

Let us turn then from student quality to faculty quality. There is really nothing we can say to make this problem any easier. Good scholars are very scarce. You would think, in fact, they would command the highest salaries of anyone in the community. But, instead, their salaries have always been low and, in purchasing power, they have been getting relatively lower. Our colleges and universities are being subsidized by their faculty members who, in the nation as a whole, forego a billion dollars a year in salary because they love to live in a university atmosphere. Now that is very generous and loyal of them—but the universities are courting disaster if they allow this contribution to continue. More remunerating, and in some ways equally rewarding, opportunities are available outside the universities for scientists and engineers—especially young ones not yet bitten with the university bug. The quality of our faculties will surely erode away if we do not find ways of keeping a very much larger fraction of these bright young men in the teaching profession. The seed corn of the future is such a valuable resource that we must promptly begin to adopt more realistic methods of conserving it. The second

report of the President's Commission on Education Beyond the High School flatly recommends that average faculty salaries be doubled in the next five to ten years. It is about the most sensible suggestion I have heard.

To have first-class colleges we *must* have first-rate faculty and there is just no room for further argument on that point. We'll either get first-class talent and pay for it—or we will have second-rate universities. Again the decision rests with the American people.

But this is no easy task. To double the top salary levels of professors in the leading universities means bringing them from the present \$10,000-\$15,000 salary levels to \$20,000-\$30,000. Now \$20,000 is the annual income on some \$500,000 endowment, and \$30,000 is the income on \$750,000. A group of 100 professors then will require an endowment of \$50,000,000 to \$75,000,000. Not more than 15 private institutions in the nation have that much endowment to cover all expenses. The Ford Foundation recently made munificent gifts totaling \$250,000,000 to the accredited private colleges of the country—some 600 in number. This was about equal to one year's salary budget for these institutions. As an endowment, therefore, it provided about a 4 per cent salary increase. To *double* the salaries in these same institutions would have taken an endowment gift of 6½ billion dollars! Impossible? Well, at least we must admit it won't be easy and we ought to get to work.

Someone, of course, will promptly say that all this is irrelevant: "You can't buy brains." I have already said that money isn't everything; that many

people stay in teaching because they love it.

As a matter of fact, the entire science and engineering profession suffers from a disease of low salaries—or at least unbalanced salaries. A newspaper columnist quite recently has dismissed the whole shortage problem of scientists and engineers as nonexistent because salaries for engineers had not risen as rapidly as in other fields. The law of supply and demand, he said, will tell how big the shortage is. This, of course, ignores the psychological fact that a trained engineer would rather be an engineer at \$8,000 than a salesman at \$15,000. Conversely, offering a \$5,000 salesman a salary of \$8,000 does not make an engineer out of him. Hence, professional people generally are not in direct competition with other workers; and hence, even though scarce, they have lagged behind the rest of the economy in average real earnings. Teachers, unfortunately—though especially scarce—have lagged most of all, because the born teacher simply cannot bring himself to go into other fields. But teachers must also eat; their families must eat; their children must be educated. We will greatly increase our chances of keeping many talented young people in university teaching if we pay them more reasonable salaries. When a young Ph.D. is offered a starting salary in industry greater than the salary his professor receives after 30 years experience, he is likely to conclude that university career opportunities have unfortunate limitations!

Leadership

The third qualitative criterion in university education is that of leadership:

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METER MOUNTING DEVICES

the leadership of the faculty, of the deans and other administrative officers, of the president and the trustees. Someone must set up the ideals which an institution seeks to achieve—and then keep the helm firmly fixed in that direction.

In 1908 a great scientist and scientific leader named George Ellery Hale became a trustee of a private manual training school in Pasadena, California. He persuaded the other trustees that Southern California needed a technical university "second to none" in the nation. Fortunately, he wasn't laughed at, and within two years Throop Polytechnic School had transferred to other schools its 600 elementary and high school students, had retained its best 30 college students, moved them to a new campus and established a policy and a program which led straight to the California Institute of Technology of today. Leadership with vision and with determination brought to reality what in 1908 must have seemed to many to be a hollow boast.

A similar story has been repeated at many institutions. Inspired leadership will attract inspired faculty; they will attract first-class students; and all together they will attract the necessary funds to make first-class institutions.

I cannot tell you how to manufacture inspired leadership among the trustees, faculty and administration of our technical colleges. I can only say that without it new goals of high quality cannot be attained.

In his biography of John D. Rockefeller, Jr., Dr. Raymond B. Fosdick says of Dr. Wickliffe Rose, onetime head of the General Education Board—a Rockefeller creation—that his (Rose's) inconsistent policy in supporting education was expressed in a single phrase: "Make the peaks higher." Where inspired leadership was found—in administration or faculty—he advocated supporting it to the limit. Where superb quality was being achieved, he wanted to make it still better.

I believe higher education in America could well adopt Dr. Rose's motto, "Make the peaks higher." This does not prevent making the base broader too—in fact, it requires it. But it brings out the fact that a major function of a broader base is not to take up more space, but to support the higher peaks.

There is no use blinking the fact that such a policy is quite contrary to the views held by many educators. There are many who, in fact, advocate the contrary thesis; namely, "leave the peaks alone and fill up the valleys." Their thesis would be to help the weak or so-called "needy" institutions rather than the best ones. This, it is claimed, is "the democratic way."

Now no one could deny for a moment that it is to the national interest to have many good universities, and that it is desirable for every college and university to get a little better. But it is equally important that there be a few institutions—we dare not hope for more than a few—of really superb quality. We must, for the sake of future generations, have a few outstanding leaders, a few institutions who are blazing the trails of the future.

Now do we recognize these leaders among our institutions? How do we recognize the places where there are basically new and important ideas developing in faculty and administration, and where new ideas are being quickly and effectively expressed in institutional policy and practice?

Shall we ask the faculty? the president? the trustees?

They might be said to be biased!

Shall we ask the students?

Their views, though valuable, may be a bit limited.

The alumni?

Their views—by definition—are out of date, by the number of years elapsed since graduation.

The extraordinary fact is that no single group appears to be wholly adequate and reliable in quality judgment.

Yet, if we set about to discover which are the 10 leading schools of engineering in the country, we would find among a group of informed sources a remarkable degree of unanimity. If, for example, we ask those responsible people who are currently employing scientists and engineers and who give careful attention to the achievements of those they hire—such as the deans of engineering colleges, or the directors or personnel managers of engineering laboratories—we will find that quality of educational product *can* be judged. Indeed high quality stands out in a most conspicuous fashion.

I suggest, in any case, that a prime task for the coming years is to find these centers of leadership—and "to build the peaks higher."

Facilities

The last criterion of quality achievement can be briefly treated. A good institution needs adequate facilities. A good faculty needs adequate material support. "Mark Hopkins on one end of a log and a student on the other" is a fine ideal. But as a New York State Court, passing on the taxability of student and faculty residences, once remarked: "Institutions early learned that a student must live somewhere else than the end of a log. Nor is the other end a suitable residence for the teacher—particularly in northern New York. Bricks and mortar are often despised as providing a substitute for scholarship. And one must admit that a great stone monument may house a mausoleum as often as a university. But bricks and mortar, steel and concrete are essential elements in a fine technical institution. We must have laboratories for teaching

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and research; libraries where the knowledge of the past is readily accessible to the present; living, dining and recreation facilities to a life of scholarship—these things are essential to students and faculty alike.

Hardheaded businessmen are inclined to criticize universities for making such "inefficient use" of space. A classroom, they say, is only 6 hours a day, 5 days a week, only 9 months a year. Why not 70 hours a week instead of 30? Why not 12 months a year?

Well, why do we use the bedrooms in our houses only 8 hours a day? Why not take turns sleeping and make one bedroom do the work of three? Also, why do automobile assembly lines operate only 40 hours a week—with 6 weeks off every fall to change models?

The answer is, of course, that machines are made for men—not men for machines. Buildings and laboratories are designed to make learning easier, not harder. The time of people—of students, of faculty, of other employees—is far more valuable than the building space they need. It is poor economy to impede the work of a \$20,000 professor (in 1965, that is!) for many years for lack of a few thousand dollars' worth of space. The entire capital cost of a university plant is often no more than 3 to 5 times the operating expenses for a year. And even if classrooms can stand being used 12 months a year, neither the teacher nor the student can. I do not defend real inefficient use of facilities where it exists—but in our technical colleges such inefficiency is rare. The lights burn late, summer and winter, in most engineering colleges I have seen. In fact, practically every major college of engi-

neering I know has outgrown its plant to the point where it is necessary for foundations, individuals and corporations to give more generous consideration to providing adequate housing to institutions which have demonstrated high-class performance.

Can we then sum up the conclusions of this rambling discourse? Let me try.

1. One brilliant creative scientist or engineer may turn up with more new ideas than 100 ordinary ones. He may, in fact, need the help of the 100 in putting his ideas to use. Hence, while we are educating the 100 we should not fail to find and encourage and give special attention to the *one*.

2. Since we cannot always pick out "the *one*" at an early age, we must provide opportunities for *many*—and we will need the *many*, too.

3. Since we can, on the other hand, select some—even if not all—superior students at an early age, there should be a few places where those students can go for challenging opportunities.

4. Lest we end up with first-rate students studying under second-rate professors, we must find ways of keeping more first-class professors in the universities.

5. A colossal task faces America in doubling our educational plant and staff during coming years and at the same time improving its quality. We may by 1972 have to spend twice as much for higher education as we do for cigarettes! If we can only make clear to the American people what the task is, I feel sure they will tighten their belts and make the sacrifice.

Finally, may I say again why our insistence on quality is so important? No

one in this room needs to be told, of course. But there has grown up an impression in certain quarters that industry and government—and even universities—have become so absorbed in numbers that they have forgotten quality. There is, in fact, a danger that the concern about numbers has given the public the impression that engineers can be counted up just like ditch diggers: to dig twice as many ditches, just hire twice as many diggers.

Now you and I know that nothing could be further from the truth. And it's time we told the truth more emphatically. Everyone here knows that the really sweeping new ideas in science and engineering have come from a very small number of brains. In any company, in any laboratory, the number of real technical advances is determined not by the total number on the staff, but by the number of unusually competent creative minds among them. I said previously that the country needs technical people at all levels—which is true because second-level men are needed to back up the top ones; third-level to back up the second level; and many competent draftsmen, designers and technicians to convert ideas into usable hardware. But the pace of the whole effort is set by those at the top level—intellectually speaking. The major new ideas of the next decade will come from a dozen minds; the major advances in putting those ideas to work will come from a few hundred exceptionally able and well-trained scientists and engineers. If we can double *that* number then we will surely accelerate the rate of progress. But if we double only at the bottom and not at the top, then we may indeed doubt whether the effort is worthwhile.

We must make everyone in the nation aware of the fact that education is the foundation of national strength; that in building an adequate educational system we must aim always to "build the peaks higher"—for it will always be true indeed that the best is none too good.

Gold Strike

Gold can be found at Sutter's Mill again, reports *Chemical Week*. The California find this time is radioactive gold. The American River by the historic mill has been seeded with "hot" gold to measure water flow rates.

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Electronics is Key SAC Element

As the advent of missile warfare reduces the warning time of attack to a matter of minutes, the latest electronic communications aids will be vital in getting America's air power into the air to counterattack before an aggressor can immobilize them.

This was stated in Chicago, Oct. 8, by Gen. Thomas S. Power, commander-in-chief of the Strategic Air Command.

Electronics, the SAC commander told a luncheon of the National Electronics Conference at the Hotel Sherman, is the key element in enabling the SAC to cope with continuous advances in weapons technology.

In addition to communications, the general added, electronics serves the SAC in other ways, including bombing and navigations systems, fire control systems, and other airborne devices.

A modern jet bomber may require as many as 2,000 electronic tubes, he said.

Power, who succeeded Gen. Curtis E. LeMay as commander of SAC, said electronics also contributes to a large variety of ground and support operations such as weather forecasting and transmission of weather data; in conducting war games indispensable in planning, and in many other operations.

He described SAC's subterranean control center as "a marvel of electronics."

"The magnitude of electronics' contribution to the Strategic Air Command," Power said, "stems essentially from two factors—the size and scope of this long-range nuclear striking force which represents an investment of over \$17 billion, and the character of its mission.

"The primary objective of SAC's mission is to deter aggression through its capability of mounting immediate and simultaneous counterattacks designed to destroy the aggressor's war-making capacity.

"The accomplishment of this global mission entails a far-flung system of bases and aircraft whose instantaneous and effective employment in case of emergency depends on what is undoubtedly the most extensive and complex communications network in existence."

Dependency on electronics also has created numerous operational problems, the four-star officer added.

"In order to fully exploit the advances made in electronics during recent years," he explained, "it is, therefore, necessary to consolidate these gains by devoting more attention to the operations problems." He said this applies especially to "reliability and maintainability which require much further improvement to permit the effective accomplishment of SAC's mission."

Other problem areas, he continued, pertain to the need for greater self-sufficiency of maintenance facilities; reduction in warm-up and check-out requirements; better compatibility of components supplied by different manufacturers; continued reduction in weight and cost; less susceptibility to severe environmental conditions, and requirements for better test and training equipment.

SAC's principal asset, according to Power, is its organization of highly experienced professionals which is flexible enough to be adaptable to any new weapons or techniques, no matter how revolutionary.

"But to cope effectively with the continuous advancements in weapons technology," he said, "these men must be given tools which are not only commensurately advanced but also suitable for operational use under the stringent conditions ensuing from the scope and character of SAC's vital mission. Few, if any of these tools would be possible without the contribution of electronics."

The National Electronics Conference is sponsored annually by American Institute of Electrical Engineers, Illinois Institute of Technology, Institute of Radio Engineers, and Northwestern and

Illinois universities, in cooperation with Electronic Industries Association, Society of Motion Picture and Television Engineers, and Michigan State, Purdue, Michigan, Notre Dame and Wisconsin universities.

More Engineers Seek Advanced Degrees

An increase of 17 per cent in the number of working engineers seeking advanced degrees in the night engineering program at Saint Louis University's Institute of Technology, was announced Dec. 23 by Gerald E. Dreifke, program director.

Enrollment for the semester rose to 246 from 210 last year, with a marked increase in the number of full-time students, Dreifke said.

The students, almost all of whom seek master of science degrees, represent 14 St. Louis firms, which pay some or all of the tuition for their employees, either as part-time students or full-time students on academic leave from their firms.

McDonnell Aircraft Corporation has the most engineers enrolled in the night classes with 117. Emerson Electric Manufacturing Company has 49; Vickers Electric Division, 16; and Universal Match Corporation, 12.

The students hold bachelor's and master's degrees from 63 colleges and universities.

Courses offered include advanced engineering mechanics, servomechanisms, digital computers, theoretical stress analysis and elastic stability, complex function theory, aerodynamics, stability and control of aircraft, symmetrical components, advanced network theory and transistor electronics.

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Reviews of Technical Books



Iron Ore Beneficiation

Iron Ore Beneficiation, by Lawrence A. Roe, Minerals Publishing Company, Lake Bluff, Ill. 1957. Pages, 305. Price, \$5.00.

The field of minerals beneficiation has been expanding rapidly and at the same time growing in complexity. Specialization has been the result. Since few previous books on this subject have appeared, *Iron Ore Beneficiation* should be good news in the beneficiation industry. Though the book is somewhat limited, it is still a big first step.

Not much attention was paid to the fast vanishing reserves of domestic iron ores of shipping grade until about the time of World War II. The war, by its drastic drain on iron ore, encouraged and increased the study of beneficiation. Many beneficiation engineers left their previous specialization and joined the iron ore industry. Further, several iron ore beneficiation laboratories were established.

The methods of beneficiation of non-ferrous metals such as copper, gold, lead, tin, and others have been studied and adopted for use with iron ore. At the same time, methods useful for preparing iron ore have been used with the ores of other metals.

The new engineers and laboratories found the information of the beneficiation of iron ore scattered, however. There was no collected and codified information on the subject. *Iron Ore Beneficiation* betters the situation considerably, and fills a real need. It should serve as a handy and useful reference work for beneficiation engineers.

Chapter headings for the volume are: History; Sources & Economics; Iron Ore Minerals; Washing and Jigging; Heavy-Media Separation Processes; Tabling & Spiral Treatment; Flotation; Magnetic Separation; Pyrometallurgical Processing; Hydrometallurgy & By-Products; Agglomeration; and Research.

Basic Electrical Engineering

Basic Electrical Engineering, by A. E. Fitzgerald and David E. Higginbotham, McGraw-Hill Book Company, Inc., New York 36, N. Y. Second edition, 1957. Pages, 540. Price, \$7.50.

This volume stresses the scientific, analytical, and physical background of modern electrical engineering. It recognizes the great importance of electronics, measurements, and control in all branches of engineering. It presents a well integrated and comprehensive introduction to these fields, and to the fields of machinery and power.

Basic Electrical Engineering gives nearly equal emphasis to the main electrical engineering subdivisions. This emphasis includes circuit theory, machinery, industrial electronics

and measurements, and feedback-control systems. The volume starts with simple statements of the elementary principals of electricity resulting from classical experiments. The fundamental methods of analysis that are of the greatest importance in these fields are then presented.

This second edition of *Basic Electrical Engineering* presents new concepts more gradually than was done in the first edition. Fuller explanations are also given. In this volume feedback control systems are given introductory treatment. Polarity conventions and sign conventions get more attention in this volume. Included also is material on magnetic amplifiers, transistors, self balancing recorders and controllers, phase-sensitive modulation and demodulation, control amplifiers, d-c and a-c control motors, and transfer-function and frequency-response analysis.

Diagrams, graphs, and pictures make for increased clarity and interest. Examples with complete solutions appear in this edition as they did in the first, as do a variety of tested problems.

Work Sampling

Work Sampling, by Ralph M. Barnes, John Wiley & Sons, Inc., New York 16, N. Y. 1957. Pages, 322. Price, \$7.95.

This book explains the ins and outs of this simple and effective way to measure working and nonworking time of office and factory people employed on indirect activities. The volume is for industrial engineers, supervisors, managers, and all those concerned with the activities of people and the operation of machines, tools, and equipment.

Dr. Barnes, after putting down the fundamentals, gives explicit instructions on how to make a work sampling study. His book then presents detailed results of research in the field and actual examples of work sampling's applications. From the realm of research itself come a variety of complete papers including Tippett's "A Snap-Reading Method of Making Time Studies of Machines and Operatives in Factory Surveys." Recent reports on performance sampling made by the author and his colleagues also appear here, as well as the work of other pioneers and specialists whose reports are published here for the first time.

Dr. Barnes is professor of engineering and production management at the University of California in Los Angeles. His previous books include the second edition of *Motion and Time Study Applications*, *Work Methods Manual*, and *Motion and Time Study Problems and Projects*.

Two films that demonstrate the use of the work sampling technique can be borrowed or purchased from the Motion Picture Production Department, Extension Division, University of California, Los Angeles 24, California. Originated by Dr. Barnes, both films contain valuable material that can be used to supplement his books.

U.S. Titanium Sponge Capacity Increases

During 1957, United States titanium sponge capacity reached 27,000 tons a year and integrated facilities designed for titanium became available for the first time, reports W. J. Harris, Jr., in the January, 1958, issue of *Journal of Metals*, published by The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

Dr. Harris is Executive Director, Materials Advisory Board, National Academy of Sciences.

His article points out the following:

Last year it became possible to produce continuous cold-rolled titanium strip to 0.020-in. with very few intermediate anneals from sheet-bar. The article went on to state that:

There are at least three interesting approaches to the heat treatment of titanium alloy sheet, and these were extensively explored during 1957. The first involves enclosing titanium sheets in steel envelopes and heating and quenching the partially evacuated envelope. A second method involves resistance-heating of sheet under slight tension followed by spray quenching. A third process is the use of a roller hearth furnace, holding the sheet between rolls and spray quenching it as it moves through the rolls. All of these processes have been applied to 36x96 in. sheet in experimental quantities during 1957.

During 1957 a number of new alloys moved toward the production stage, including the heat treated alpha-beta alloys in the Government's titanium sheet rolling program, as follows: The 4A1-3V-1Mo alloy, the 16V-2 1/2A1 alloy, and the 6A1-4V alloy. All alpha alloys of higher creep resistance than the 110A alloy have been introduced and are being evaluated, and all-beta alloys have been produced in limited quantities for evaluation.

Titanium and titanium alloys have fulfilled most of the technical promise originally held out for them. On the other hand, titanium now faces increased competition from steel, and it may eventually find competition from beryllium. Steel has the advantage of acceptable weldability and of much lower cost. Thin, high-strength steel alloy strip is available and is finding a place in sand-

wich construction. Because of lack of availability of thin strips of titanium, until very recently and because of its limited weldability, titanium has not appeared so promising for this application.

Scientists Advised To Sell Themselves

Scientists and engineers are at fault to a large extent for the false notions held by the general public about them and about research and technology.

This opinion was expressed in Chicago Dec. 17 by Dr. Christopher E. Barthel, Jr., assistant director of Armour Research Foundation of Illinois Institute of Technology, in an address before the American Society of Agricultural Engineers.

"We must sell ourselves to society," the research administrator said.

"How many times have we heard the expression, 'We must get down to the lay level,'" he asked. "Rather, we should get out of our shells and work ourselves up to this level."

Barthel called attention to the need to work with persons in other fields of human endeavor to earn a greater prestige than has been given to the professions in the past.

"We must act as interpreters of scientific engineering activities for the layman," he suggested.

"It is too much to expect the average layman to comprehend the complexities of modern technology," he said, "and they can only understand this technology if we can present it to them in a way that they can understand."

Scientists and engineers must act as spokesman for basic research, Barthel

pointed out, emphasizing that basic research is the raw material from which future progress is made.

He also urged them to give personal advice and counsel on secondary education problems, stating that school authorities cannot be expected to develop an adequate program in mathematics and the sciences without such advice and counsel.

As individuals, he continued, scientists and engineers must maintain close liaison with colleges and universities.

"It is the responsibility of colleges and universities to train the type of persons required for our future growth and development," he pointed out. "We must provide them with information to permit them to handle their basic responsibility."

Calling on scientists and engineers to accept administrative responsibilities involved in the direction of research and development activities, Barthel emphasized that persons well trained in science and technology are essential to integrate properly the science and technology functions into the government, education, and industry structures.

New Type Bus

A bus with a built-in, adjustable ramp that will deliver 56 people from downtown areas directly onto planes parked at the end of runways is in the drawing-board stage, reports *Aviation Week*. The bus has an hydraulically-lifted passenger-loading ramp. It can be adjusted to match the height of the plane's entrance door, and thus avoid need for planes, especially jets, to taxi long distances, eliminating clutter of aircraft around the immediate vicinity of terminals.

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News of Engineers

Otis D. Gouty, of Kansas City, Mo., has joined the headquarters staff of the American Society of Civil Engineers in New York City as assistant to the secretary. Mr. Gouty's duties will be primarily concerned with the student chapters and local sections of ASCE.

Before entering the University of Kansas, where he is a graduate with a degree in civil engineering, Mr. Gouty served in the U. S. Air Force during the Korean War. He is a member of Sigma Tau and Tau Beta Pi, national honorary engineering societies.

Gouty formerly served as engineer with the Central States Pipe Lines Division of the Socony Mobil Oil Co., at Wichita, Kans.

* * *

Joseph H. Cadieux, formerly vice president of Misco Precision Casting Company, Whitehall, Mich., has been named vice president of Casting Engineers Incorporated, Chicago.

This announcement was made by Vincent S. Lazzara, Casting Engineers' president.

In his new post, Cadieux will direct all company manufacturing operations, and will supervise the company's forthcoming million dollar expansion program.

He joined Misco in 1954 as plant manager of its Detroit Division, was named vice-president in 1957. Prior to that, he was associated with the Ford Tractor & Implement Division, Birmingham, Mich., and Woodall Industries, Detroit.

Cadieux is a member of the American Rocket Society, the Society of Plastics Engineers, The Engineering Society of Detroit and the American Chemical Society.

* * *

One of the nation's top architectural teams is operating under a new name. Morris Ketchum, Jr., J. Stanley Sharp and Robert MacKinnon, Jr. will continue their long association as the partnership of Ketchum and Sharp, Architects.

These partners helped to achieve national and international recognition for

their former firm Ketchum, Gina & Sharp. This recognition includes many awards for distinguished architecture from the American Institute of Architects, the New York State Association of Architects, the City of White Plains, *Progressive Architecture* magazine, *School Executive* magazine, the Baltimore Chamber of Commerce, the Fifth Avenue Association (New York), and other professional and civic groups. One of the latest awards came in Dec., 1957, from the American Association of School Administrators for the design of the new John Jay High School at Cross River, N.Y.

* * *

Dr. Donald J. McPherson has been appointed manager of the metals research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

His appointment was announced by Dr. E. H. Schulz, MWSE, assistant director for research operations at the Foundation.

McPherson, formerly assistant manager of the metals department, replaces Robert A. Lubker, who was named director of research at the Alan Wood Steel Co., Conshohocken, Pa.

In his new position, McPherson will be in charge of the Foundation's research in electrochemistry, foundry and steelmaking, welding, metallurgical processes, and extractive, nonferrous, physical, powder, reactor, and applied metallurgy.

An authority in the field of titanium and its alloys, McPherson joined the Foundation as a research metallurgist in 1950. He was advanced to supervisor of physical metallurgy in 1952, supervisor of nonferrous metals in 1954, and assistant manager in 1955.

Before coming to the Foundation, he served as an associate metallurgist at Argonne National Laboratory.

In 1956, McPherson was one of four executives named outstanding young men by the city's Junior Association of Commerce and Industry.

A native of Columbus, Ohio, McPherson received a B.S. degree in metallurgical engineering and M.S. and Ph.D. degrees in metallurgy, all from Ohio State University.

The author of numerous papers dealing with titanium and its alloys, McPherson has served with a number of government committees working on development of titanium for defense applications.

He also has served as chairman of the titanium committee of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

McPherson served in the Navy from 1944 to 1946.

* * *

John R. Bowman, director of research at the Mellon Institute, Pittsburgh, since 1954, has been appointed associate dean of the Northwestern University Technological Institute and professor of science engineering.

In announcing the appointment, Dean Harold B. Gotaas said Bowman will devote portions of his time to development of new research programs at the Technological Institute and also will be in charge of the graduate program. The



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position of associate dean is a new office at the Institute.

Bowman received the professional progress award from the American Institute of Chemical Engineers in 1954. He has been a director of the American Institute of Chemists for the past seven years.

A native of New York City, Bowman received a bachelor of science degree in chemistry from the University of Pittsburgh in 1929 and studied mathematics and physics at the California Institute of Technology the next two years. In 1934 he received a doctoral degree in mathematics and biology from the University of Pittsburgh.

Prior to becoming director of research at Mellon Institute, he was head of the Institute's department of research in physical chemistry for six years.

Bowman has published numerous reports and papers and holds 12 U. S. patents, including several for calculating machines and amplifiers. He was general chairman of the national meeting of the Association for Computing Machinery in 1952. Since 1940, he has

been an honorary research associate of the Carnegie Museum.

* * *

Herbert P. Sedwick, past president WSE, president of Public Service Company Division of Commonwealth Edison Company, retired from active service on Jan. 31. He will continue to serve on the Edison Board of Directors.

Sedwick's 44-year career with the utility spans a period of spectacular development in the electric industry in northern Illinois. When he joined the former Public Service Company of Northern Illinois in 1913, the firm was providing about 60,000 customers with a combination of utility services. Today, as a result of the rapid growth of industry and residential areas throughout the territory and mergers with associated companies, Public Service's exclusively electric service reaches more than 800,000 customers.

Mr. Sedwick became associated, as an engineer, with early operations of Public Service Company in Evanston, Waukegan, and Crystal Lake. Progressing through various managerial and engineering assignments, he became general division manager of the company in 1933. He was elected vice-president in 1941 and executive vice-president in 1951.

Sedwick was elected president of Public Service Company of Northern Illinois and executive vice-president of Commonwealth Edison in 1953, prior to the former's merger into Edison. Since the merger he has continued to head the Public Service Company Division and served as executive vice-president of Edison from 1953 to 1955. He has been a director of Commonwealth since 1952.

When Northern Illinois Gas Company was organized in 1953 to take over the

gas business of Public Service Company, Sedwick was named the first president of the gas company. He served in that capacity until 1954 and then as vice-chairman and director until 1955.

Affiliated with engineering and civic organizations throughout his career, Mr. Sedwick is a member of the American Institute of Electrical Engineers and a past president and honorary member of the Western Society of Engineers. He is a member of the Board of Trustees of the Illinois Institute of Technology and president of The John Crerar Library. He is a former director of the Chicago Regional Planning Association and a member of The Citizens Board of the University of Chicago. He is a member of the Chicago Club and of the Commercial Club of Chicago.

The duties now conducted by Mr. Sedwick will be taken over by J. Harris Ward, executive vice-president of Commonwealth Edison.

* * *

Lester B. Knight & Associates, Inc., has appointed J. H. Bertrand as Vice-President—Plant Engineering, in Chicago, and J. M. Planten as Vice-President—Plant Engineering, in New York.

Peripatetic Producer

A mobile plant that can move overnight to a new raw-material source and start up production in five hours, is reported in *Factory Management and Maintenance*. Consisting of 13 trailers, the roving plant, in the first year of operation, ran up savings of one-and-a-half times the cost of the plant itself, including all its specially designed equipment.

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WSE Applications

In accordance with Article I, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the MIDWEST ENGINEER magazine.

Richard W. Forsythe, Field Engineer B, Northern Illinois Gas Co., 615 Eastern Av., Bellwood, Ill.

Donald J. Haraburd, Engineer Trainee, Mississippi Valley Structural Steel Co., 1600 N. 25th Ave., Melrose Park, Ill.

Raymond G. Kessler, Field Engineer B, Northern Illinois Gas Co., 615 Eastern Av., Bellwood, Ill.

Roy H. Carpenter, Senior Engineer, Western Electric Co., 323 S. Franklin St.

Leonard M. Gordon, Designing Engineer, Sargent & Lundy, 140 S. Dearborn St.

Edward E. Dollmeyer, Engineer, Link-Belt Co., 2410 W. 18th St.

John W. Schoen, Jr., Mech. Squad Leader, Vern E. Alden Co., 33 N. LaSalle St.

Richard L. Storer, Planning Engineer, Public Service Co., Skokie Highway & Dundee Rd., Northbrook, Ill.

Frank Strobl, Engineer, Link-Belt Co., 2410 W. 18th St.

Henry S. Mirrow, Chemical Engineer, Industrial Electro Chemical Lab., 2111 Dewey, Evanston, Ill.

Thomas J. Wysockey, Supt., Thatcher Engineering Co., 718 Atlantic, Waukegan, Ill.

William W. Blase, Box 126, Hamel, Ill., attending University of Illinois.

Joseph Fleischer, Supt. of Constr'n., City of Chicago, City Hall.

Patrick Flanagan, Elect. Des. Draftsman, A. J. Boynton & Co., 109 N. Wabash Av.

R. L. Holmes, Design Engineer, S & C Electric Co., 4435 N. Ravenswood Av.

Leo J. Wind, Coordinator, United States Steel Corp., 3426 E. 89th St.

Thomas O'Shea, Mechanical Engineer, Skidmore, Owings & Merrill, 37 S. Wabash Av.

Raoul D. Pounds, Arch. & Struct. Draftsman, A. A. Lipsey & Associates, 21 E. Bellevue Pl.

Mario Rizzo, Testing Engineer, Chicago Transit Authority, Merchandise Mart.

W. R. Steur, Mechanical Engineer, Sargent & Lundy, 140 S. Dearborn St.

Supersonic Aerial Camera is Developed

The development of a supersonic aerial still camera for low altitude supersonic flight use was announced Jan. 22 in Pasadena, Calif. by Hycon Mfg. Company. The announcement was made by Donald G. Saurenman, executive vice-president and general manager, upon receipt of a \$1.13 million USAF contract for production quantities. The camera, known as the type LA-11A, has a newly-developed ultra-high speed focal plane shutter that stops motion on forward oblique photographs. To do this, the camera shutter curtain reaches speeds of 200 inches per second within 20 milliseconds. Because of perspective effect, such differential image motion cannot be satisfactorily compensated for by conventional IMC (image motion compensation).

Other unique camera features are the coordinated action of the iris and shutter and the ability to vary shutter slit width remotely from the cockpit.

The initial operational application of the LA-11A, according to the Air Force

for whom the camera was developed, will be in the nose of the McDonnell RF-101 supersonic jet aircraft. The first two of 224 production cameras will be delivered within nine months.

The LA-11A has a 12" f/3.8 lens mounted in an integral cone. It will take almost 500 pictures per mission when equipped with the A-9B film magazine and makes exposures at a rate of two per second at shutter speeds of from 1/200 to 1/1600 of a second.

The camera's focal plane shutter and iris are coordinated in operation to provide maximum picture quality for the system.

The pilot may set the camera cycling rate, start and stop the camera's cycling and change exposure from his cockpit position by servo control.

The LA-11A is constructed to withstand severe environmental tests and has a built-in temperature control to maintain uniform operation. Without magazine but including lens, the camera weighs 37 lbs. and is 15" x 15 1/2" x 16 1/2" overall.

Hycon Mfg. Company is one of the largest aerial camera and electronic reconnaissance system manufacturers in the nation. The company has contracts also for guided missile systems, missile check-out systems, and military and commercial system and components.

Glass Smokestack

A new type smokestack—glass protected inside as well as out—has been developed, reports *Factory Management and Maintenance*. This discovery writes fins to corrosion cares, and also gives three-to-five times longer service than a regular smokestack.

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Brazilian Iron Ore To Become Available

Large quantities of high-grade Brazilian iron ore concentrates will be available at a minimum production cost, a survey of the potential of itabirite ores in that country has revealed.

The survey is being conducted for the Brazilian government by the international research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Foundation engineers, economists, and geologists are developing a research program which will provide maximum foreign exchange benefits for Brazil, according to Paul B. W. Gollong, department manager.

Vast deposits of itabirite iron ores are located in the state of Mina Gerais, Brazil, Gollong explained. Nearly pure hematite iron ore currently is being mined in the area and sold in lump form on the world market.

"The itabirite ore, a mixture of quartz and hematite, has tremendous potential," he said, "but awaits development of suitable beneficiation techniques for extensive exploitation."

In order to determine the possibility of exploiting this ore as a source of foreign exchange, the Brazilian Economic Development Council contracted ARF to evaluate the situation and propose a long-range plan.

Objectives of the research program:
—Develop the best process for beneficiation and agglomeration of itabirite ore.

—Determine the potential size, location, nature, and duration of world markets for itabirite ores and their derivative products.

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—Determine the technical and economic feasibility of producing possible itabirite derivative products in Brazil.

ARF researchers presently are engaged in testing various means of beneficiating itabirite ore, according to project coordinator Nathan Federgreen. He indicated that initial results are promising because of the ore's softness, freedom from contaminating materials, and ideal crystalline structure.

Economic and market studies are proceeding concurrently with the technical work, Federgreen noted. Iron and steel companies in the United States and Europe are being contacted in this connection.

"There appears to be an excellent market for the uniformly high grade concentrate or agglomerate obtainable from itabirite," he said. "A major problem will be to locate adequate and economical marine transportation to markets. This phase of the study also is under way."

The Foundation will make recommendations to Brazil covering a practical plan and general policy outline for long range competitive distribution and marketing of itabirite ore derivative products on the world market. Included will be a forecast of the annual long range investment requirement, profits, and foreign exchange benefits resulting from the recommended program.

Recommendations also will be made on the specific process, estimated cost of construction and operation at various levels of output, and the general area of location for ore beneficiation and agglomeration. These recommendations will be based partially on a review of domestic land transportation problems and a collection of data pertinent to the evaluation of probable routes, ports, means, and cost of transporting ore.

An on-the-spot study of geological conditions and mining procedures in the areas selected for strip mining of itabirite ores was made earlier by ARF.

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Obituaries

Mr. Leo N. Newman, executive vice-president and general manager of Josam Manufacturing Company, Michigan City, Indiana, passed away on January 13 at the age of 57. Mr. Newman will be long remembered for his activity in the plumbing drainage field as well as his attendance at conventions of the N.A.P.C. He had also served as a director of the American Society of Sanitary Engineering where his principal interest lay in polio research.

Leo Newman was a 32nd degree Mason and a member of the Shrine as well as several social and welfare organizations.

He is survived by his wife, the former Ruth Hirshstein, his son Jerrold of Toronto, Canada, his daughter Roslyn Wollin of Michigan City, Indiana, and three grandchildren.

Electronic Ambient Temperatures Rise

Ultra high temperatures of some of our modern electronic equipment when in operation has made it necessary to develop materials and components for them that will withstand the extreme heat, the American Institute of Electrical Engineers was advised on Feb. 3 during the annual Winter Meeting at the Hotel Statler in New York.

These ambient temperatures are steadily rising and may reach as high as 500 degrees centigrade in the future in military and other applications, with today's temperatures in the 100 to 200 degree centigrade range.

Many materials and component developments are now under way with 500 degrees centigrade as the goal, the engineers were told by G. E. Walter, J. F. Rippin and H. B. Harms of the General Electric Company, Fort Wayne, Ind., in a paper on "Ultra High Temperature Electronic Transformers."

The paper reviewed objectives, progress and experiences in developing the electronic transformer. Behaviour of metals and their combinations when exposed to high temperatures were described.

Stating the development objectives and approach the engineers said:

"Development activity was concentrated to the extent that the transformer electrical ratings were selected for 400 cycles per second frequency and a maximum of 1500 volts RMS and 1 KVA output. The goal for the operating life was 1000 hours. The environmental conditions the transformers were expected to withstand included the major ones of 500°C temperature, intense nuclear radiation and low air density (corresponding to 100,000 feet altitude) and the mechanical ones such as 50 G shock, 15 G vibration up to 3000 cycles per second and resistance to thermal cycling and moisture. These were to be withstood separately or in such combinations as simultaneous high ambient temperature, high nuclear radiation, shock and vibration.

The basic philosophy of the development work was to use tests and studies of individual materials for preliminary screening and accumulation of basic performance data. Complete units were then built from the most promising individual materials and re-tested under

conditions of high temperature, nuclear radiation and other environments. This limited the more complicated life and environmental tests to a relatively small number of systems or combinations of materials while giving a reasonably sound basis for selecting these combinations."

U.S. Steel Develops Aluminum Coated Wire

A revolutionary new product with indications of a remarkably long life—aluminum coated barbed wire and farm fence—is finally approaching the commercial stage after extensive field testing, Van H. Leichliter, president of U. S. Steel's American Steel and Wire Division, disclosed Jan. 9 in Cleveland.

Virtually free of progressive corrosion, the new wire gives promise of considerably longer service than conventional zinc-coated wire.

"Our research people report the new wire, which has been in the field up to five years, shows absolutely no sign of deterioration," Leichliter said.

H. M. Francis, Wire Division vice-president of sales, said that although the new product is not ready for active commercial promotion, it is being evaluated commercially in several selective areas.

One of its most interesting and unusual features is the soft, golden hue which the wire takes on after a few weeks or months of use.

"We produce a silvery aluminum coated wire and in a short time it is a golden bronze and remains that color indefinitely," Leichliter explained. "We feel that these attributes—longer life and a new attractive color—will make for a lively demand when we are geared to offer it commercially."

The new aluminum coated wire will be made principally in the 9 to 14 gauge thicknesses.

Sub Detectors

Underwater detecting techniques have now been so radically improved, they can protect a country against a submarine attack, the way radar protects against air attacks, reports *Electronics*. Also important will be a good many commercial byproducts gained from the new technique, as in the case of radar's later non-military applications.

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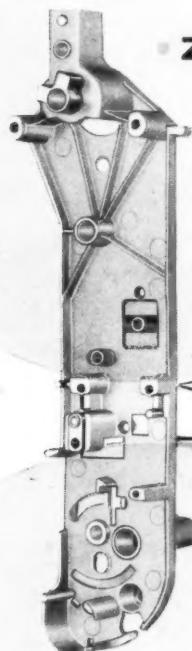
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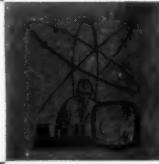
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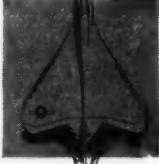
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